PATENT ABSTRACTS OF JAPAN

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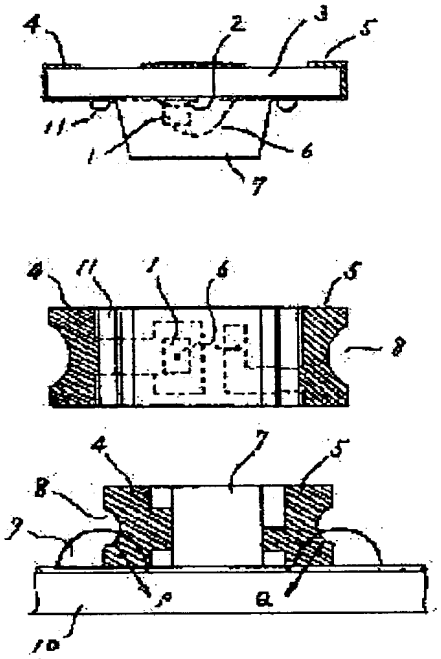
(54) LATERAL EMISSION LED AND MANUFACTURE THEREOF

(57)Abstract:
PROBLEM TO BE SOLVED: To enhance the bonding strength of an LED by making recesses in the regions above the bottom face of a substrate at the opposite ends thereof to be soldered and forming a metal layer composing the electrode pattern on the curved surface of the recess.
SOLUTION: Semicylindrical recesses 8 are made in the opposite end faces at a substrate part 3 in the longitudinal direction thereof. The recess 8 is made above the bottom face while traversing the end face. Metal layers are then formed across the opposite end faces and only the concave surface of the recess 8 in the metal layer is subjected to metal plating. With such a structure of LED, solder 9 enters into the recess 8 at the time of soldering an external board and a bonding force is generated to press the substrate part in P, Q directions thus enhancing adhesion to the external board. Consequently, the bonding strength of LED can be enhanced.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] It is the horizontal luminescence mold LED with which it has a luminescence chip and the substrate section in which this luminescence chip is carried, and said substrate section is perpendicularly fixed to the external fixing section. In the horizontal luminescence mold LED with which it comes to take about the electrode pattern for performing electrical installation of said luminescence chip in said substrate section even at a rear-face side, and soldering immobilization of the electrode pattern of the edge of said substrate section is carried out to said fixing section A crevice is formed in the field above said substrate section base so that a pewter may press these both ends to said fixing section to the both ends to which said substrate section is soldered. The horizontal luminescence mold LED characterized by coming at least to form in the curved-surface section of said crevice the metal layer which constitutes the part of said electrode pattern.
[Claim 2] the horizontal luminescence mold LED of claim 1 -- setting -- said crevice -- the flat surface of said fixing section, and abbreviation -- the horizontal luminescence mold LED characterized by becoming as a boiled-fish-paste configuration which crosses the both-ends side of said substrate section in the parallel direction.
[Claim 3] In the manufacture approach of the horizontal luminescence mold LED of carrying two or more luminescence chips in the substrate section by which patterning was carried out, performing wirebonding, carrying out cutting division for every luminescence chip after that, and obtaining LED of the horizontal luminescence mold according to individual The process which forms a through hole in the both-ends part which serves as the soldering section of LED according to individual at the time of said patterning beforehand, The manufacture approach of the horizontal luminescence mold LED characterized by cutting said through hole to coincidence at the time of cutting for every luminescence chip, and including the process which makes the curved surface of the through hole after this cutting the crevice which presses the both ends of the substrate section of each LED in the external fixing section.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the chip LED of a horizontal luminescence mold especially about the luminescence device used as the light source of various display panels, the back light of a liquid crystal display, the light source of an illumination switch, etc.
[0002]
[Description of the Prior Art] The conventional semi-conductor light emitting device is explained with reference to drawing 4 and drawing 5 . Drawing 4 and drawing 5 are the perspective views and sectional views of the horizontal luminescence mold LED (it is only hereafter described as LED) by the conventional example, respectively. As shown in drawing 4 , the horizontal luminescence mold LED 100 is being fixed with the pewter 103 to the electrode pattern 102 of a substrate 101. the reinforcement in which the resin coating section by which 104 was prepared in the chip luminescence direction of LED100, the metal plating section for the pewter connection with a substrate etc. in 105, and 106 were prepared to reinforcement of immobilization of LED -- public funds -- it is the group plating section.
[0003] The manufacture approach of Above LED is explained with reference to drawing 6 (a) and (b). Drawing 6 (a) and (b) are the plan showing one production process, and the sectional view of LED of an item, respectively. First, as shown in drawing 6 , on the double-sided substrate 202 constituted so that the electric flow of a front flesh side might be taken by the plating 201 formed in the wall of the slit section 200, two or more LED chips 203 are arranged, by money 204, electrical installation and after closing by resin 205 further, a dicing cut is carried out in the direction of X, and LED according to individual is obtained.
[0004] Thus, if a dicing cut is carried out in the direction of X, in the cut cross section (Ath page), a deposit will hardly remain. This cut side (Ath page) is a connection fixed side to a substrate etc., and does not contribute the cut side which does not have plating in this way to immobilization of LED. Therefore, also in drawing 5 , a pewter 103 will not enter the gap (Bth page) of a substrate 101 and LED100, and immobilization in the substrate 101 of LED100 will be performed only in the metal plating 105 and the metal plating section 106 for reinforcement which were exposed outside.
[0005]
[Problem(s) to be Solved by the Invention] By the way, since according to the LED fixed approach shown in drawing 5 there is no metal layer in the component side (Bth page) to the substrate of LED etc. as mentioned above, when it fixes with a pewter, pewter connection will be made only according to a field perpendicular to a substrate. Consequently, there were the following problems conventionally.
[0006] That is, since there was no metal layer in the base of LED100 when performing soldering by the reflow method especially using a cream pewter, there was a case where a location gap of LED arose. Moreover, after mounting to a substrate 101, when the mounting substrate 101 curves, the problem that LED100 drops out is.
[0007] on the other hand, it is shown in drawing 4 -- as -- the luminescence side of LED100, and an opposite side -- reinforcement of a dummy -- public funds -- although there is also a method of forming the group plating section 106 and attaining stabilization of a location -- this approach -- this reinforcement -- public funds -- with a substrate, since the group plating section 106 is perpendicular, it produces the above-mentioned problem too, and it does not become fundamental solution. Moreover, a problem arises from needing the excessive soldering section also in tooth space, and it leads also to a cost rise.
[0008] Moreover, in order to prepare a metal layer in the base of LED100, after carrying out the dicing cut of each LED, plating at the pars basilaris ossis occipitalis is also considered, but since it will plate to LED according to individual, a routing counter increases extremely and it leads to a cost rise too, it is not desirable.
[0009] Then, the purpose of this invention is to offer the horizontal luminescence mold LED which can improve the fixed reinforcement to a substrate etc. with simple structure.
[0010]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention has a luminescence chip and the substrate section in which this luminescence chip is carried. It is the horizontal luminescence mold LED with which said substrate section is perpendicularly fixed to the external fixing section. In the horizontal luminescence mold LED with which it comes to take about the electrode pattern for performing electrical installation of said luminescence chip in said substrate section even at a rear-face side, and soldering immobilization of the electrode pattern of the edge of said substrate section is carried out to said fixing section It is characterized by a crevice being formed in the field above said substrate section base so that a pewter may press these both ends to said fixing section, and coming to form the metal layer which constitutes the part of said electrode pattern in the curved-surface section of said crevice at least in the both ends to which said substrate section is soldered.
[0011] Thus, since a crevice is established in the both-ends side of the substrate section in this invention and he is trying to press the edge of the substrate section to the fixing sections (external substrate etc.), the bond strength of LED can be improved. When it was the former, when connection resilience was inadequate since LED is [that vertical connection is only made and], and pewter immobilization was carried out by the reflow method to an external substrate using a cream pewter, it had the case where a location gap of LED arose. Moreover, although the problem that LED dropped out was when a mounting substrate curved after mounting to a

substrate, according to the above-mentioned structure, these problems can be solved and high dependability is acquired by location precision and the mechanical strength. or the reinforcement which was the need conventionally because of the improvement in pewter on the strength — public funds — since there is also no need of preparing the group plating section, there is also an advantage that a tooth space is effectively utilizable.

[0012] moreover, said crevice — the flat surface of said fixing section, and abbreviation — it is characterized by becoming as a boiled-fish-paste configuration which crosses the both-ends side of said substrate section in the parallel direction.

[0013] This boiled-fish-paste configuration is a configuration acquired by the manufacture approach shown by this invention, and has the advantage that it can realize without changing the conventional production process sharply so that it may mention later. the point further mentioned as a description of this invention here — a concave surface — the flat surface of the fixing section, and abbreviation — it is formed in the parallel direction. If it becomes as a crevice is only prepared, forming in the flat surface of the fixing section perpendicularly will also be considered, but although the adhesion area of a pewter increases in this case, since the force which presses a substrate edge to a root face is not produced, bigger connection resilience than before is not obtained.

[0014] As the manufacture approach of the horizontal luminescence mold LED of this invention In the manufacture approach of carrying two or more luminescence chips in the substrate section by which patterning was carried out, performing wirebonding, carrying out cutting division for every luminescence chip after that, and obtaining LED of the horizontal luminescence mold according to individual The process which forms a through hole in the both-ends part which serves as the soldering section of LED according to individual at the time of said patterning beforehand, It is characterized by cutting said through hole to coincidence at the time of cutting for every luminescence chip, and including the process which makes the curved surface of the through hole after this cutting the crevice which presses the both ends of the substrate section of each LED in the external fixing section.

[0015] Thus, according to this invention, a high location precision and a high mechanical strength are obtained only by simple process addition of preparing a through hole at the time of patterning.

[0016]

[Embodiment of the Invention] The description of this invention is that it raised the adhesion force over a substrate in the conventional horizontal luminescence mold LED by not performing a process top, metal plating, etc. to the base of the LED substrate section, but establishing a crevice for whose connection force having been inadequate in the both-ends side of the LED substrate section. Moreover, it is in the point of having offered the approach of forming especially this crevice, without changing a process sharply.

[0017] Hereafter, one example by this invention is concretely explained with reference to drawing 1 R> 1 (a) thru/or (c). Drawing 1 (a) thru/or (c) are the plans, front views, and side elevations of the horizontal luminescence mold LED by this example (it is only hereafter described as LED), respectively.

[0018] As shown in drawing 1 , the LED chip 1 is carried on the electrode pattern 4 of the substrate section 3 with the conductive paste 2. the electrode pattern 4 — the end face (metal plating section of the crevice 8 mentioned later) of the longitudinal direction of the substrate section 3 — passing — a rear face — moreover, the electrode pattern 5 is similarly taken about at the rear face through the end face (metal plating section of the crevice 8 mentioned later) of the longitudinal direction of the opposite side of the substrate section 3. Moreover, the LED chip 1 is connected to the electrode pattern 5 by the gold streak 6. The mold of the LED chip 1 and the gold streak 6 is carried out with resin 7.

[0019] And the boiled-fish-paste-like crevice 8 is established in the both-ends side of the longitudinal direction of the substrate section 3. this crevice 8 — the base (C side) of the substrate section 3 — the upper part (namely, spacing — opening) — and it is formed so that an end face may be crossed. And metal plating is performed only to the concave surface of a crevice 8 by the metal layer of a both-ends side so that clearly from drawing 1 (c). Though natural, even if this is based on the production process of this LED mentioned later, and metal plating is performed all over the end face, it is satisfactory in any way.

[0020] According to the structure of this LED, connection resilience can be improved when pewter connection is made at the external substrate 10. That is, since the crevice 8 is formed as shown in drawing 2 , the fixing force which a pewter 9 enters this crevice 8 and presses in P and the direction of Q among drawing occurs, and the adhesion force to the external substrate 10 improves. Since it was [that connection of an external substrate and a perpendicular direction is only made, and] as shown in drawing 5 when it was the former, connection resilience was inadequate, and since there was no metal layer in the pars basilaris ossis occipitalis of LED when carrying out pewter immobilization by the reflow method using a cream pewter, there was a case where a location gap of LED arose. Moreover, although the problem that LED dropped out was when a mounting substrate curved after mounting to a substrate, according to this example, the above-mentioned problem can be solved and high dependability is acquired by location precision and the mechanical strength.

[0021] moreover, reinforcement as shown in drawing 4 — public funds — since there is also no need of forming the group plating section 106, there is also an advantage that a tooth space is effectively utilizable.

[0022] By the way, in order to generate the above-mentioned P and the fixing force of the direction of Q, the connection section (drawing 2 lower part of the curved surface of a crevice 8) for pressing a both-ends side caudad is required. For example, since the force pressed caudad is not produced even if it establishes a crevice in the corner of the base of the substrate section 3, effectiveness like this example is not expectable. Or if it becomes as a crevice is only prepared, forming in the flat surface of the fixing section perpendicularly will also be considered, but although the adhesion area of a pewter increases in this case, since the force which presses a substrate edge to a root face is not produced, bigger connection resilience than before is not obtained.

[0023] Moreover, as long as it is the structure of producing the force pressed caudad, it may not necessarily restrict to a boiled-fish-paste-like crevice and cross-section configurations may have the shape of a polygon, such as a trigonum and a rectangular head. Furthermore, a crevice may be formed in a part of end face even if it is not the configuration which crosses the whole end face.

[0024] In addition, 11 shown in drawing 1 is a resist, and can avoid the resin crack at the time of pewter immobilization by preparing this. In case LED is soldered to the external substrate 10 By a pewter 9 being transmitted to the electrode patterns 4 and 5, and contacting resin 7 1) Although exfoliation with 2 resin 7 and the substrate section 3 which a crack produces to resin 7 arises from the difference in coefficient of linear expansion and the problem which a gold streak disconnects by 3 heat stress as a result that moisture invades into 4 luminescence chip may arise By preventing contact of this pewter 9 by the above-mentioned resist 11, the above-mentioned problem is avoidable. Epoxy, an acrylic, etc. can be used as an ingredient of a resist 11.

[0025] Next, the manufacture approach of Above LED is explained with reference to the 1 production-process Fig. of drawing 3 R> 3. The approach shown in drawing 3 carries two or more luminescence chips in the substrate section by which patterning was carried out,

performs wirebondlng, and performs the manufacture approach of carrying out cutting division for every luminescence chip after that, and obtaining LED of the horizontal luminescence mold according to individual.
[0026] Thus, although the method of perform fragmentation according to individual be a common knowledge technique as show in drawing 6 after make connection of much luminescence chips etc. at once, the description of this invention be in a point including the process which carry out metal plating of formation and the through hole wall for a through hole 12 to the both ends part which serve as the soldering section of LED according to individual at the time of patterning of a substrate beforehand. And as usual, after performing wire bonding, resin coating, etc., it divides for every luminescence chip along the dicing lines 13 and 14, and individual LED is obtained.
[0027] Consequently, plating does not exist in the cutting plane of LED cut along the dicing line 13 conventionally like structure. On the other hand, although plating does not exist in the flat-surface section about the cutting plane of LED divided along the dicing line 14, plating exists in the curved-surface section, i.e., the divided wall of a through hole 12. And the wall of this through hole 12 serves as a crevice 8.
[0028] Thus, LED created by the manufacture approach of this invention serves as the structure of having the crevice 8 of the shape of boiled fish paste which constitutes an electrode pattern at the edge which should carry out pewter immobilization. Here, although there will be no plating only in the flat-surface section in the both sides of a crevice 8, it applies to a crevice 8 from an LED lateral portion, and the electrode pattern serves as one continuation, and since it has the operation to which the pewter 9 which turned to the crevice 8 conventionally unlike structure moreover presses the edge of LED to the external substrate 10, very bigger bond strength than before is obtained.
[0029] As mentioned above, LED which has big connection resilience can be offered, without requiring a major change, even if it compares with a process conventionally.
[0030] In addition, in this example, although the thing of the type which makes wire connection by the gold streak as a luminescence chip was used, this invention is applicable also to the luminescence chip of the type which does not use a gold streak, for example.
[0031]
[Effect of the Invention] Since a crevice is established in the both-ends side of the substrate section of the horizontal luminescence mold LED and he is trying to press the edge of the substrate section to the fixing sections (external substrate etc.) according to this invention, the bond strength of LED can be improved. When it was the former, when connection resilience was inadequate since LED is [that vertical connection is only made and], and pewter immobilization was carried out by the reflow method to an external substrate using a cream pewter, it had the case where a location gap of LED arose. Moreover, although the problem that LED dropped out was when a mounting substrate curved after mounting to a substrate, according to the above-mentioned structure, these problems can be solved and high dependability is acquired by location precision and the mechanical strength.
[0032] or the reinforcement conventionally prepared for the improvement in pewter on the strength — public funds — since it becomes unnecessary [the group plating section], a tooth space is effectively utilizable.
[0033] Moreover, formation of said crevice is easily realizable by the manufacture approach of this invention of cutting a through hole. in this case, the configuration of a crevice — the flat surface of the fixing section, and abbreviation — it becomes the boiled-fish-paste configuration which crosses the both-ends side of the substrate section in the parallel direction. If it is this configuration, it can realize without changing the conventional production process sharply.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] (a) Or (c) is the plan, front view, and side elevation of the horizontal luminescence mold LED by one example of this invention, respectively.
[Drawing 2] It is the side elevation showing the substrate connection condition of the horizontal luminescence mold LED by one example of this invention.
[Drawing 3] (a) And (b) is the plan and sectional view for explaining the production process of the horizontal luminescence mold LED by one example of this invention, respectively.
[Drawing 4] It is the perspective view of the horizontal luminescence mold LED by the conventional example.
[Drawing 5] It is the side elevation showing the substrate connection condition of the horizontal luminescence mold LED by the conventional example.
[Drawing 6] (a) And (b) is the plan and sectional view for explaining the production process of the horizontal luminescence mold LED by the conventional example, respectively.
[Description of Notations]
1 Luminescence Chip
3 Substrate Section
4 Five Electrode pattern
8 Crevice
9 Pewter
10 Fixing Section (External Substrate)
12 Through Hole

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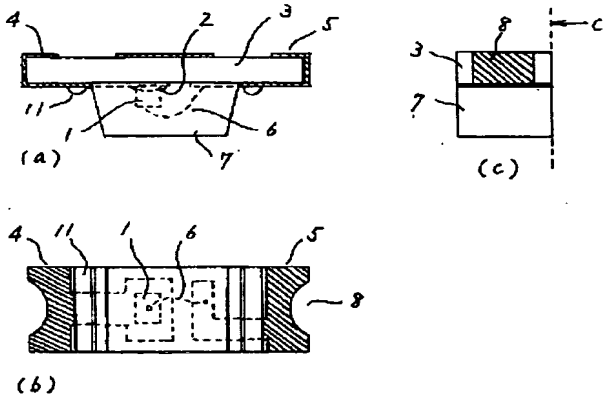
(54)【発明の名称】　横発光型ＬＥＤおよびその製造方法

(57)【要約】

【課題】　従来の横発光型ＬＥＤは基板等への接続強度が十分でないという問題があった。これに対し、補強用パターンを設けても、余分なスペースを必要とする上、接続強度の大きな改善は見込めなかった。

【解決手段】　ＬＥＤの基板部３の内、固着部（外部基板）１０へハンダ付けされる両端部に、該両端部をハンダが固着部１０に対して押圧するように、基板部３底面より上の領域に凹部８が形成され、且つ少なくとも凹部８の曲面部に電極パターン４、５の部分を構成する金属層が形成されてなることを特徴とする。



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【特許請求の範囲】

【請求項１】　発光チップと、該発光チップが搭載される基板部とを有し、前記基板部が外部の固着部に対して垂直方向に固定される横発光型ＬＥＤであって、前記基板部には前記発光チップの電気的接続を行うための電極パターンが裏面側にまで引き回されてなり、前記基板部の端部の電極パターンが前記固着部に対してハンダ付け固定される横発光型ＬＥＤにおいて、

前記基板部のハンダ付けされる両端部に、該両端部をハンダが前記固着部に対して押圧するように前記基板部底面より上の領域に凹部が形成され、少なくとも前記凹部の曲面部に前記電極パターンの部分を構成する金属層が形成されてなることを特徴とする横発光型ＬＥＤ。

【請求項２】　請求項１の横発光型ＬＥＤにおいて、前記凹部は前記固着部の平面と略平行な方向に前記基板部の両端面を横切るカマボコ形状としてなることを特徴とする横発光型ＬＥＤ。

【請求項３】　パターニングされた基板部に複数の発光チップを搭載、ワイヤボンディングを行い、その後各発光チップ毎に切断分割して個別の横発光型のＬＥＤを得る横発光型ＬＥＤの製造方法において、

前記パターニング時に、個別のＬＥＤのハンダ付け部となる両端部部分に予めスルーホールを形成する工程と、各発光チップ毎の切断時に前記スルーホールを同時に切断して該切断後のスルーホールの曲面を、各ＬＥＤの基板部の両端部を外部の固着部に押圧する凹部とする工程と、を含むことを特徴とする横発光型ＬＥＤの製造方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、各種表示パネルの光源、液晶表示装置のバックライト、照光スイッチの光源等として使用される発光デバイスに関し、特に横発光型のチップＬＥＤに関する。

【０００２】

【従来の技術】従来の半導体発光素子について、図４及び図５を参照して説明する。図４及び図５はそれぞれ、従来例による横発光型ＬＥＤ（以下、単にＬＥＤと記す）の斜視図及び断面図である。図４に示すように、横発光型ＬＥＤ１００が、基板１０１の電極パターン１０２に対してハンダ１０３によって固定されている。１０４はＬＥＤ１００のチップ発光方向に設けられた樹脂コーテイング部、１０５は基板等へのハンダ接続用の金属メッキ部、１０６はＬＥＤの固定の補強用に設けられた補強用金属メッキ部である。

【０００３】上記ＬＥＤの製造方法について、図６（ａ）及び（ｂ）を参照して説明する。図６（ａ）及び（ｂ）はそれぞれ、一製造工程を示す上面図及び単品のＬＥＤの断面図である。まず、図６に示すように、スリット部２００の内壁に形成したメッキ２０１で表裏の電

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気的導通をとるように構成した両面基板２０２上に、ＬＥＤチップ２０３を複数個配列し、金銭２０４で電気的接続、さらに樹脂２０５で封止した後に、Ｘ方向にダイシングカットし、個別のＬＥＤを得る。

【０００４】このように、Ｘ方向でダイシングカットすると、そのカット断面（Ａ面）にはメッキ層がほとんど残留しない。このカット面（Ａ面）は基板等への接続固定面であり、このようにメッキが無いカット面はＬＥＤの固定には寄与しない。従って、図５においても、ハンダ１０３が基板１０１とＬＥＤ１００との間隙（Ｂ面）に入り込むことはなく、ＬＥＤ１００の基板１０１への固定は、外部に露出した金属メッキ１０５及び補強用金属メッキ部１０６のみにおいて行われることになる。

【０００５】

【発明が解決しようとする課題】ところで、図５に示すＬＥＤ固定方法によれば、前述したように、ＬＥＤの基板等への実装面（Ｂ面）には金属層がないので、ハンダで固定する場合、基板と垂直な面のみによってハンダ接続することになる。この結果、従来より以下のような問題があった。

【０００６】即ち、ハンダ付けを、特にクリームハンダを使用してリフロー法により行う場合、ＬＥＤ１００の底面に金属層がないために、ＬＥＤの位置ずれが生じる場合があった。また、基板１０１への実装後に、実装基板１０１が反った場合にＬＥＤ１００が脱落するという問題がある。

【０００７】これに対して、図４に示すように、ＬＥＤ１００の発光側と反対面にダミーの補強用金属メッキ部１０６を設けて位置の安定化を図る方法もあるが、この方法でも、この補強用金属メッキ部１０６は基板と垂直方向であるので、上記問題はやはり生じ、根本的な解決にはならない。また、余分なハンダ付け部を必要とすることから、スペース的にも問題が生じコストアップにもつながる。

【０００８】また、ＬＥＤ１００の底面に金属層を設けるために、各ＬＥＤをダイシングカットした後に底部にメッキを施すことも考えられるが、個別のＬＥＤに対してメッキを行うこととなって工程数が極めて増加し、やはりコストアップにつながるので望ましくない。

【０００９】そこで、本発明の目的は、簡易な構造で基板等に対する固定強度を向上できる横発光型ＬＥＤを提供することにある。

【００１０】

【課題を解決するための手段】上記目的を達成するために、本発明は、発光チップと、該発光チップが搭載される基板部とを有し、前記基板部が外部の固着部に対して垂直方向に固定される横発光型ＬＥＤであって、前記基板部には前記発光チップの電気的接続を行うための電極パターンが裏面側にまで引き回されてなり、前記基板部の端部の電極パターンが前記固着部に対してハンダ付け

固定される横発光型ＬＥＤにおいて、前記基板部のハンダ付けされる両端部に、該両端部をハンダが前記固着部に対して押圧するように前記基板部底面より上の領域に凹部が形成され、少なくとも前記凹部の曲面部に前記電極パターンの部分を構成する金属層が形成されてなることを特徴とする。

【００１１】このように、本発明では基板部の両端面に凹部を設けて基板部の端部を固着部（外部基板等）に対して押圧するようにしているので、ＬＥＤの接着強度を向上できる。従来であれば、ＬＥＤは外部基板に対して垂直方向の接続が行われるのみであるので接続強度が不十分であり、クリームハンダを使用してリフロー法によりハンダ固定する場合、ＬＥＤの位置ずれが生じる場合があった。また、基板への実装後に、実装基板が反った場合にＬＥＤが脱落するという問題があったが、上記構造によればこれらの問題は解消でき、位置精度や機械的強度に高い信頼性が得られる。或は、ハンダ強度向上のために従来必要であった補強用金属メッキ部を設ける必要も無いので、スペースを有効に活用できるという利点もある。

【００１２】また、前記凹部は前記固着部の平面と略平行な方向に前記基板部の両端面を横切るカマボコ形状としてなることを特徴とする。

【００１３】このカマボコ形状は、本発明で示す製造方法によって得られる形状であり、後述するように従来の製造工程を大幅に変更する事なく実現できるという利点がある。ここで、さらに本発明の特徴として挙げられる点は、凹面が固着部の平面と略平行な方向に形成されていることである。単に凹部を設けるだけならば、固着部の平面に垂直方向に形成することも考えられるが、この場合にはハンダの接着面積は増加するものの、基板端部を固着面に押圧する力は生じないため、従来より大きな接続強度は得られない。

【００１４】本発明の横発光型ＬＥＤの製造方法としては、パターニングされた基板部に複数の発光チップを搭載、ワイヤボンディングを行い、その後各発光チップ毎に切断分割して個別の横発光型のＬＥＤを得る製造方法において、前記パターニング時に、個別のＬＥＤのハンダ付け部となる両端部部分に予めスルーホールを形成する工程と、各発光チップ毎の切断時に前記スルーホールを同時に切断して該切断後のスルーホールの曲面を、各ＬＥＤの基板部の両端部を外部の固着部に押圧する凹部とする工程と、を含むことを特徴とする。

【００１５】このように、本発明によれば、パターニング時にスルーホールを設けるという簡易な工程追加のみで、高い位置精度や機械的強度が得られる。

【００１６】

【発明の実施の形態】本発明の特徴は、従来の横発光型ＬＥＤにおいて、ＬＥＤ基板部の底面には工程上、金属メッキ等が施されておらず接続力が不十分であったのを、ＬＥＤ基板部の両端面に凹部を設けることによって、基板に対する密着力を向上させた点にある。また、この凹部を特に工程を大幅に変更することなく形成する方法を提供した点にある。

【００１７】以下、本発明による一実施例について、図１（ａ）乃至（ｃ）を参照して具体的に説明する。図１（ａ）乃至（ｃ）はそれぞれ、本実施例による横発光型ＬＥＤ（以下、単にＬＥＤと記す）の上面図、正面図および側面図である。

【００１８】図１に示すように、ＬＥＤチップ１は導電性ペースト２によって、基板部３の電極パターン４上に搭載されている。電極パターン４は基板部３の長手方向の端面（後述する凹部８の金属メッキ部）を通って裏面に、また同様に電極パターン５も基板部３の反対側の長手方向の端面（後述する凹部８の金属メッキ部）を通って裏面に引き回されている。また、ＬＥＤチップ１は金線６によって電極パターン５に接続されている。ＬＥＤチップ１と金線６は樹脂７によってモールドされている。

【００１９】そして、基板部３の長手方向の両端面にはカマボコ状の凹部８が設けられている。この凹部８は基板部３の底面（Ｃ面）より上方で（即ち、間隔を開けて）、且つ端面を横切るように形成されている。そして、両端面の金属層は図１（ｃ）から明らかなように、凹部８の凹面にのみ金属メッキが施されている。これは、後述するこのＬＥＤの製造工程に因るものであり、当然ながら端面全面に金属メッキが施されていてもなんら問題はない。

【００２０】このＬＥＤの構造によれば、外部基板１０にハンダ接続した時に、接続強度を向上できる。即ち、図２に示すように、凹部８を設けているので、ハンダ９がこの凹部８に入り込み、図中、Ｐ，Ｑ方向に押圧する固着力が発生し、外部基板１０への密着力が向上する。従来であれば、図５に示すように、外部基板と垂直方向の接続が行われるのみであるので、接続強度が不十分であり、クリームハンダを使用してリフロー法によりハンダ固定する場合、ＬＥＤの底部に金属層がないために、ＬＥＤの位置ずれが生じる場合があった。また、基板への実装後に、実装基板が反った場合にＬＥＤが脱落するという問題があったが、本実施例によれば上記問題は解消でき、位置精度や機械的強度に高い信頼性が得られる。

【００２１】また、図４に示すような、補強用金属メッキ部１０６を設ける必要も無いので、スペースを有効に活用できるという利点もある。

【００２２】ところで、上記のＰ，Ｑ方向の固着力を発生させるためには、両端面を下方に押圧するための引っ掛かり部（図２では凹部８の曲面の下方）が必要である。例えば、基板部３の底面の角部に凹部を設けても、下方に押圧する力は生じないので、本実施例のような効

果は期待できない。或は、単に凹部を設けるだけならば、固着部の平面に垂直方向に形成することも考えられるが、この場合にはハンダの接着面積は増加するものの、基板端部を固着面に押圧する力は生じないため、従来より大きな接続強度は得られない。

【００２３】また、下方に押圧する力を生じさせる構造であれば、必ずしもカマボコ状の凹部に限ることは無く、断面形状が三角、四角等の多角形状であってもよい。さらに、端面全体を横切る形状でなくても端面の一部に凹部が形成されたものであってもよい。

【００２４】なお、図１に示した１１はレジストであり、これを設けることによってハンダ固定時の樹脂クラックを回避することができる。ＬＥＤを外部基板１０にハンダ付けする際には、ハンダ９が電極パターン４，５を伝って樹脂７に接触することによって、１）線膨張係数の違いから樹脂７にクラックが生じる、２）樹脂７と基板部３との剥離が生じる、そして、この結果、３）熱ストレスによって金線が断線する、４）発光チップに水分が侵入するという問題が生じ得るが、このハンダ９の接触を上記レジスト１１によって防止することによって、上記問題を回避できる。レジスト１１の材料としては、エポキシ、アクリル等が使用できる。

【００２５】次に、上記ＬＥＤの製造方法について、図３の一製造工程図を参照して説明する。図３に示す方法は、パターニングされた基板部に複数の発光チップを搭載、ワイヤボンディングを行い、その後各発光チップ毎に切断分割して個別の横発光型のＬＥＤを得る製造方法を行うものである。

【００２６】このように、一度に多数の発光チップの接続等を行った後に、個別の分断を行う方法は図６に示すように周知技術であるが、本発明の特徴は、基板のパターニング時に、個別のＬＥＤのハンダ付け部となる両端部部分に予めスルーホール１２を形成、スルーホール内壁を金属メッキする工程を含む点にある。そして、従来と同様、ワイヤーボンディング、樹脂コーティング等を行った後に、ダイシングライン１３、１４に沿って各発光チップ毎に分断して個別ＬＥＤを得る。

【００２７】この結果、ダイシングライン１３に沿って切断したＬＥＤの切断面には、従来構造と同様、メッキは存在しない。一方、ダイシングライン１４に沿って分断したＬＥＤの切断面については、平面部にはメッキは存在しないが、曲面部、即ち分断されたスルーホール１２の内壁にはメッキが存在している。そして、このスルーホール１２の内壁が凹部８となる。

【００２８】このように本発明の製造方法によって作成されたＬＥＤは、ハンダ固定するべき端部に電極パターンを構成するカマボコ状の凹部８を有する構造となる。ここで、凹部８の両側にある平面部のみにはメッキがないことになるが、ＬＥＤ側面部から凹部８にかけて電極パターンは一続きとなっており、しかも、従来構造とは異なり、凹部８に回り込んだハンダ９がＬＥＤの端部を外部基板１０に押圧する作用を有するので、従来よりも非常に大きな接着強度が得られる。

【００２９】以上のように、従来工程と比較しても大きな変更を要することなく、大きな接続強度を有するＬＥＤを提供できる。

【００３０】なお、本実施例においては、発光チップとして金線によってワイヤ接続するタイプのものを使用したが、例えば、金線を使用しないタイプの発光チップにも本発明は適用できる。

【００３１】

【発明の効果】本発明によれば、横発光型ＬＥＤの基板部の両端面に凹部を設けて基板部の端部を固着部（外部基板等）に対して押圧するようにしているので、ＬＥＤの接着強度を向上できる。従来であれば、ＬＥＤは外部基板に対して垂直方向の接続が行われるのみであるので接続強度が不十分であり、クリームハンダを使用してリフロー法によりハンダ固定する場合、ＬＥＤの位置ずれが生じる場合があった。また、基板への実装後に、実装基板が反った場合にＬＥＤが脱落するという問題があったが、上記構造によればこれらの問題は解消でき、位置精度や機械的強度に高い信頼性が得られる。

【００３２】或は、ハンダ強度向上のために従来設けていた補強用金属メッキ部も不要となるので、スペースを有効に活用できる。

【００３３】また、前記凹部の形成はスルーホールを切断する本発明の製造方法によって、容易に実現できる。この場合、凹部の形状は固着部の平面と略平行な方向に、基板部の両端面を横切るカマボコ形状となる。この形状であれば、従来の製造工程を大幅に変更する事なく実現できる。

【図面の簡単な説明】

【図１】（ａ）乃至（ｃ）はそれぞれ、本発明の一実施例による横発光型ＬＥＤの上面図、正面図及び側面図である。

【図２】本発明の一実施例による横発光型ＬＥＤの基板接続状態を示す側面図である。

【図３】（ａ）及び（ｂ）はそれぞれ、本発明の一実施例による横発光型ＬＥＤの製造工程を説明するための上面図及び断面図である。

【図４】従来例による横発光型ＬＥＤの斜視図である。

【図５】従来例による横発光型ＬＥＤの基板接続状態を示す側面図である。

【図６】（ａ）及び（ｂ）はそれぞれ、従来例による横発光型ＬＥＤの製造工程を説明するための上面図及び断面図である。

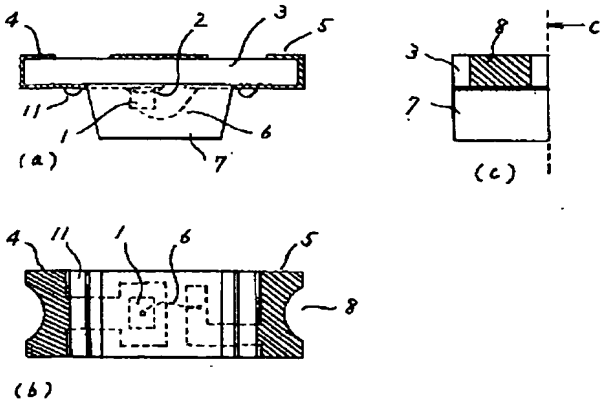
【符号の説明】

１　　発光チップ
３　　基板部
４、５　電極パターン

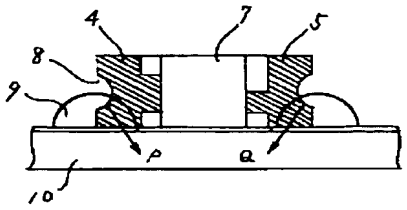
7　　8

8	凹部	＊１０	固着部（外部基板）
9	ハンダ	＊　１２	スルーホール

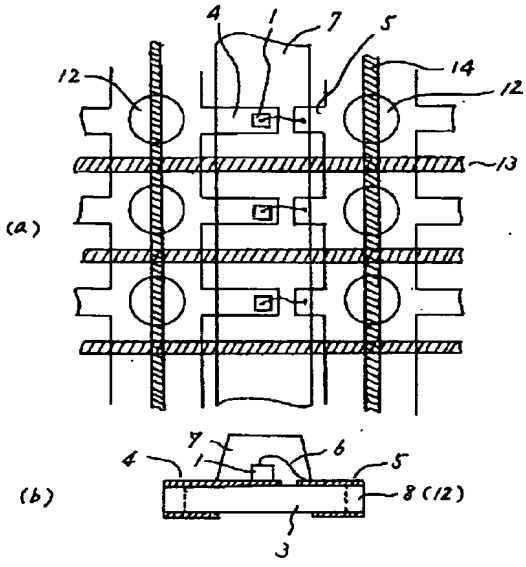
【図１】



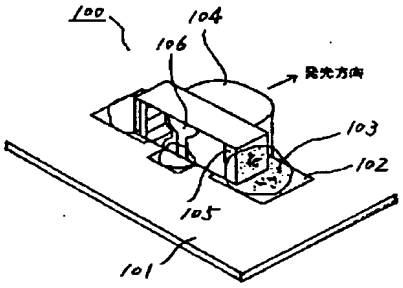
【図２】



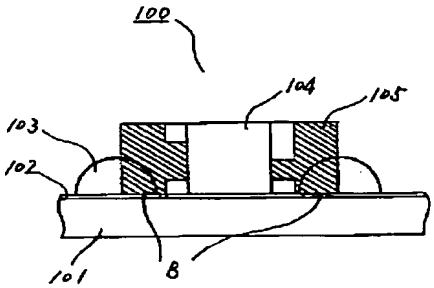
【図３】



【図４】



【図５】



【図６】